REMARKS

Claims 1, 2 and 5 are presently pending in the application.

Claim 1 has been amended to incorporate the subject matter from claims 3 and 4, now canceled. Claim 1 has also been amended to recite that R11, R14, and R15 have 8 to 18 carbon atoms, rather than 12 to 25, which is supported in the specification at least at page 22, lines 6-14. Finally, claim 1 has been amended to recite that the composition contains a component (I), a friction modifier which is at least one compound selected from the group consisting of fatty acid esters and metal salts of fatty acids. Support for this amendment may be found in the specification at least at page 39, line 1 to page 40, line 2. No new matter has been added by these amendments, and entry is respectfully requested.

In the Office Action, the Examiner has again rejected claims 1-5 under 35 U.S.C. §103(a) as being unpatentable over each of U.S. Patents Nos. 6,617,286 of Sato et al. ("Sato"); 6,638,897 of Ogano et al. ("Ogano"); and 6,730,293 of Bovington et al. ("Bovington"), and optionally in further view of U.S. Patent No. 6,613,722 of Watts ("Watts"). Applicant respectfully traverses these rejections and the arguments in support thereof for the reasons set forth previously on the record, which Applicant relies upon in full, and for the additional reasons that follow, and respectfully requests reconsideration and withdrawal of the rejections.

The Presently Claimed Invention

The presently claimed invention is directed to a lubricating oil composition having long-lasting anti-shudder properties and long fatigue life, in particular, one which is suitable for automatic transmissions and continuously variable transmissions. It was generally known in the art that the addition of sulfur-based additives which provide excellent extreme pressure and anti-wear properties to an oil composition is effective in prolonging fatigue life. However, there have been problems stemming from the use of sulfur-based additives alone because they exhibit strong activity to metal surfaces, resulting in the wear thereof by corrosion.

On the other hand, in order to maintain anti-shudder properties, it is necessary to add a proper quantity of a friction modifier for maintaining friction performances in a lock-up clutch in a better state. However, the effects achieved by the addition of the friction modifiers are relatively low. Also, the use of sulfur-based additives and friction modifiers in combination

decreases the favorable effect of the friction modifiers on the anti-shudder properties in a good state because of the deterioration in the oxidation stability of the oil composition.

Applicant has discovered that prolonged anti-shudder properties and failure life may be remarkably improved by adding (D) specific succinimide compounds represented by formula (3) and/or (4) to an oil composition comprising (A) a base oil, (B) calcium salicylate having TBN of 50 to 300 mg KOH/g, (C) a sulfur- and phosphorus-type extreme pressure additive, (E) a boron-containing ashless dispersant selected from (E-1), (E-2), and/or (E-3), and (I) a friction modifier (fatty acid esters and/or fatty acid metal salts), each of which components is contained in a specific amount based on the total mass of the composition. That is, the features of the inventive composition reside in the inclusion of (D) a specific succinimide compound, i.e., a specific low MW succinimide, to a composition containing components (A), (B), (C), (E), and (I).

The advantages achieved by the presently claimed composition are set forth in Tables 1-1 to 2-2 at pages 46-49 of the specification. Particularly, the effects achieved by the addition of Component (D) may be observed by comparing Inventive Example 2 and Comparative Example 7. Both examples are nearly the same except that the composition in Inventive Example 2 contains a specific succinimide compound as component (D). It is apparent from the results in the Tables that the oil sample of Comparative Example 7 was not able to provide satisfactory properties in terms of fatigue life and anti-shudder durability compared with that of Inventive Example 2. Such an improvement in properties of Inventive Example 2 relative to Comparative Example 7 may thus be attributed to Component (D).

Rejections Under §103(a) Based on Sato and on Sato in view of Watts

The Examiner again argues that Sato teaches a lubricating oil composition for continuously variable transmissions which comprises a lubricating base oil made of mineral oil and/or a synthetic oil formulated with a phosphorus-based wear preventative (A) (such as phosphate and phosphate esters which may contain sulfur atoms), a metal detergent additive (B), and an ashless dispersant additive (C), including boron-containing succinimides. Sato allegedly teaches that the base oil component has a kinematic viscosity of 0.5 to 200 mm^2/s at 100°C, preferably 2-25 mm^2/s at 100°C, and that mixtures of mineral oils and synthetic oils may be used in combination. Sato allegedly also teaches that the amount of the additive is within the range of

200-500 ppm as phosphorus based on the total weight of the composition. The Examiner contends that the metal detergent additive (B) includes overbased calcium salicylates having a TBN ranging from 10-450 mg KOH/g, and that the amount of metal detergent is preferably 100-1000 ppm as a metal content based on the total weight of the composition. Finally, the Examiner argues that Sato allows for the addition of other additives to the composition, including non-borated imide ashless dispersants, and thus concludes that Sato teaches the claimed elements.

In response to Applicant's previous amendments and arguments, the Examiner maintains that Sato teaches that the lubricating oil compositions may contain other additive components, including ashless dispersants (such as imide compounds that include monoimides, bisimides, etc.) in an amount of 0.1 to 10 weight % The Examiner refers to Watts as teaching that the claimed bisimides are well-known in the art as additives to lubricating oil compositions which are suitable for use in continuously variable transmissions. The non-borated succinimide is allegedly set forth in col. 10 of Watts. The Examiner also maintains that Sato teaches in col. 4, lines 53-56 that the phosphorus-based wear preventative used as component (A) includes acid phosphate ester amine salts, acid phosphite ester amine salts, and acid phosphonate amine salts, and that sulfur may be contained in such ester compounds. Accordingly, the Examiner concludes that Sato alone or in combination with Watts teaches or suggests all of the claimed elements. Applicants respectfully traverse this rejection as follows.

Sato teaches a lubricating oil composition for continuously variable transmissions that comprises a lubricating base oil formulated with a wear preventative, a metal detergent, and an ashless dispersant made of a boron-containing succinimide. However, Sato does not teach or suggest claimed components (A), (D), or (I).

Claimed component (A) comprises specific amounts of base oils (A-1) and (A-2) having particular kinematic viscosities, and thus contains a mixture of a mineral or synthetic oil and a heavy mineral oil with high kinematic viscosity. Including such a lubricating base oil provides the presently claimed composition with advantageous effects. Specifically, as demonstrated by the evaluation of Fatigue Life set forth in Tables 1-1 and 1-2 of the present application, the sample oil compositions comprising base oils (A-1) and (A-2) (Inventive Examples 7 and 8) exhibited longer fatigue life than that of (comparative) Example 2, which comprises only base oil

(A-1). Sato teaches that a variety of base oils may be included in the composition but does not teach or suggest the claimed mixture of two different oils having specific kinematic viscosities.

Regarding component (I), although both Sato and Watts disclose friction modifiers, neither reference teaches the presently claimed friction modifier, which is a fatty acid ester and/or a metal salt of a fatty acid. In col. 6, lines 17 and 21-36, Sato describes appropriate friction modifiers as amine friction modifiers and boron-containing friction modifiers. In col. 8, line 31 to col. 14, line 9, Watts teaches that friction modifiers may be amides, succinimides, or ethoxylated amines. However, neither reference teaches or suggests the claimed friction modifiers, and thus even the proposed combination of Sato with Watts would not teach or suggest all of the claimed elements.

Finally, regarding component (D), Sato indeed teaches the use of mono-imides and bis-imides in col. 6, lines 37-39, and also discloses a non-borated succinimide with a molecular weight Mw of 1400 for Comparative Example 3 in Table 1 (cols. 9-10). However, the structure of such a compound is not specifically disclosed, and thus Sato does not teach or suggest the specifically claimed succinimide compounds represented by formula (3) or (4). Further, it would not have been expected that the use of the succinimide of Watts in the composition of Sato would provide the properties, such as good long-lasting anti-shudder properties, that are exhibited by the presently claimed composition.

The purposes of Sato and Watts are clearly different from those of the presently claimed invention. Sato is directed to providing a lubricating oil composition with a high friction coefficient between metals and excellent oxidation stability. The composition of Watts is designed to control wear and friction when steel belts are used in contact with steel pulleys. It would not have been expected that the use of a specific succinimide having a low Mw would be effective at improving long-lasting anti-shudder properties in a lubricating oil composition suitable for lubricating automatic transmissions or continuously variable transmissions, a property which is exhibited by the presently claimed composition.

In order to further demonstrate the advantageous effects achieved by utilizing the claimed succinimide, Applicant has performed additional experiments, which are described in detail in the Declaration of Eitaro Morita Under 37 C.F.R. § 1.132 ("Morita Declaration"), submitted herewith.

As described in paragraph 6 of the Morita Declaration, four sample oil compositions were prepared as described in the application but using different bis-succinimides. For example, the composition denoted "Inventive Example 9" was prepared by replicating the composition of "Example 7" (set forth in Table 1-2 of the application) but by replacing bis-succinimide A with bis-succinimide B, having a molecular weight Mw of 855. That is, bis-succinimide A, diethylenetriamine bis (iso-octadecenyl) succinimide, was replaced with bis-succinimide B, tetraethylenepentamine bis (iso-octadecenyl) succinimide.

For preparing the sample composition denoted "Reference Example 1", the composition of "Example 7" of the application was replicated, but bis-succinimide A was replaced with bis-succinimide A', which has a Mw of 851 (corresponding to that of the bis-sucinimide disclosed in Bovington when the PIB has a Mw of 300).

Finally, for preparing the sample composition denoted "Reference Example 2," the composition of "Inventive Example 9" (described above) was replicated, but bis-succinimide B was replaced with bis-succinimide B', which has a Mw of 939 (corresponding to that of the bis-succinimides disclosed in Bovington when the PIB has a Mw of 300).

The following Table summarizes the details of the bis-succinimides used in Inventive Examples 7 and 9 and Reference Examples 1 and 2:

	Bis-Succinimide	**Polyamine**	**Formula (Mw) of Bis-succinimide**	**Formula (Mw) of PIB[1]**
Inventive Example 7 (Example 7 of application)	A	DETA[2]	$C_{48}H_{85}N_3O_4$ (767)	$C_{18}H_{36}$ (252)
Reference Example 1	A'	DETA	$C_{54}H_{97}N_3O_4$ (851)	$C_{21}H_{42}$ (294)
Inventive Example 9	B	TEPA[3]	$C_{52}H_{97}N_5O_4$ (855)	$C_{18}H_{36}$ (252)
Reference Example 2	B'	TEPA	$C_{58}H_{109}N_5O_4$ (939)	$C_{21}H_{42}$ (294)

[1]PIB = polyisobutenyl
[2]DETA = diethylenetriamine
[3]TEPA = tetraethylenepentamine

The four sample compositions described above were analyzed as described at pages 44-45 of the application, and the analysis results are summarized in Table A in paragraph 6 of the Morita Declaration. It can be seen that the sample oil compositions of Reference Examples 1 and 2 are inferior to those of Inventive Examples 7 and 9, respectively, in anti-shudder durability. Specifically, as explained in paragraph 7 of the Morita Declaration, the sample oil compositions of Inventive Examples 7 and 9, which contain bis-succinimide A or B as component (D), exhibited satisfactory anti-shudder durability ratio, but the sample oil compositions of Reference Examples 1 and 2, which contain bis-succinimide A' or B' as component (D), did not exhibit satisfactory anti-shudder durability ratios. Accordingly, the specific bis-succinimide and its molecular weight are critical for providing the resulting lubricating oil composition with the observed properties. Such results would not have been expected based on the prior art.

In sum, the proposed combination of Sato and Watts does not teach or suggest all of the claimed elements. Further, even if, *arguendo*, a *prima facie* case of obviousness had been established based on the proposed combination of Sato and Watts, the unexpected results exhibited by the presently claimed composition would overcome such a case. Accordingly, reconsideration and withdrawal of the § 103(a) rejections based on Sato or based on Sato in view of Watts are respectfully requested.

Rejection Under 35 U.S.C. § 103(a) Based on Ogano

The Examiner again argues that Ogano teaches a lubricating oil composition for internal combustion engines comprising a base oil composed of a mineral oil, synthetic oil, or mixtures thereof, incorporated with (A) an overbased calcium salicylate having a TBN in the range of 30-100 mgKOH/g in an amount of 0.05 to 0.90 weight % as calcium and (B) a succinimide selected from: (1) a boron-containing succinimide having a weight-average molecular weight of 3,000 or less at 0.04 weight % or less as boron, (2) a non-borated succinimide having a weight average molecular weight of 3,000 or less at 0.01 to 0.25 weight % as nitrogen, and (3) mixtures thereof. Ogano allegedly teaches that the base oils may be used individually or in combination and have a kinematic viscosity of 2 to 20 mm^2/s at 100°C. Ogano allegedly allows for the addition of other additives to the compositions, including phosphoric acid esters and phosphorus acid esters as

antiwear agents which may be used in amounts of 0.1 to 5% by weight. The Examiner thus concludes that Ogano teaches the claimed elements.

In response to Applicant's previous arguments, the Examiner argues that the disclosure of Ogano is not limited to the Examples, but to what is taught, namely, that the non-borated succinimide component may have a molecular weight of 3000 or less, preferably 2100 or less. The Examiner takes the position that the molecular weight of 621 for the mono-imide and 1053 for the bis-imide of the claims for succinimide compound (D) is within the disclosure of suitable non-borated succinimide compounds taught by Ogano.

The Examiner also takes the position that there is no structure difference between an olefin oligomer which contains straight or branched chain alkyl and alkenyl groups and the claimed alkyl or alkenyl groups having 25-25 carbon atoms. The Examiner also argues that Ogano teaches that suitable extreme pressure agents include phosphoric acid amines. Applicant respectfully traverses this rejection as follows.

Ogano teaches a lubricating oil composition for internal combustion engines that comprises a base oil incorporated with a specific calcium salicylate (A) and a specific succinimide (B). However, Ogano does not teach or suggest claimed components (A) or (C) or specifically component (D).

The importance of component (A) to the presently claimed composition has been described above. Although Ogano teaches that a variety of base oils may be included in the composition, Ogano does not teach or suggest the claimed mixture of two different oils having specific kinematic viscosities.

Regarding component (C), the Examiner argues that Ogano teaches in col. 7 the use of phosphoric acid amines as suitable extreme pressure agents. However, claimed component (C) is a "sulfur-phosphorus type extreme pressure additive." In col. 7, lines 36-41, Ogano teaches that useful extreme pressure agents include ashless-based sulfide compounds, sulfided fats and greases, phosphoric acid esters, phosphorous acid esters, and phosphoric acid amines. However, Ogano does not teach or suggest sulfur-phosphorus compounds as claimed and therefore does not teach or suggest all of the claimed elements.

Finally, regarding component (D), Ogano teaches using succinimide compounds having a weight average molecular weight (Mw) of 3000 or less, or 2500 or less, preferably 2100 or less.

However, Ogano relates to improving a lubricating oil composition for internal combustion engines to agglomerate solid impurities, such as soot, and capture and remove the agglomerated particles from the composition by an oil filter. Thus, Ogano's applicable field to a lubricating oil composition and intention are completely different from those in the present invention. As previously explained on the record, Ogano actually demonstrates Examples containing succinimides having a far higher Mw of 2065 or 2567 and does not specifically describe succinimides with low molecular weights as claimed. Although prior art references are not limited to their examples, one reading Ogano would not have been motivated to utilize a succinimide having a low molecular weight as claimed. Additionally, Ogano certainly did not recognize the effects that are provided by utilizing specific succinimides having low molecular weights, as demonstrated in the Morita Declaration.

In sum, for at least the reasons set forth above, Ogano does not teach or suggest the presently claimed invention. Further, it would not have been expected based on Ogano that the addition of the specifically claimed succinimide compound, component (D), is very effective at achieving excellent anti-shudder properties and improved fatigue life because Ogano is completely silent as to the use of the claimed succinimide compound with a relatively low Mw. Therefore, any case of *prima facie* obviousness which were to be established based on Ogano would be overcome by the unexpected results exhibited by the presently claimed invention.

Reconsideration and withdrawal of the § 103(a) rejection based on Ogano are respectfully requested.

Rejection Under §103(a) Based on Bovington and on Bovington in view of Watts

Finally, the Examiner again argues that Bovington teaches a low viscosity lubricating oil composition having no more than 0.16 mass % phosphorus, preferably less than 0.09 mass %, which comprises a lubricating oil basestock and, as additives, (a) from 1-10 mass% of a dispersant including borated and non-borated succinimides, (b) 0.05 to 0.6 mass % elemental calcium derived from one or more detergents, and optional additives including zinc dihydrocarbyl dithiophosphate, an antioxidant, a pour point depressant, and a viscosity modifier. Bovington allegedly teaches that the dispersants contain about 0.01 to 0.1 mass % boron as elemental boron, that the detergent component can have a TBN in the range of 15 to 600, and

that suitable detergents include calcium salicylates. Therefore, the Examiner concludes that Bovington teaches the claimed elements.

In response to Applicant's previous arguments, the Examiner argues that Bovington discloses a broader molecular weight range of 300 to 20,000 for the oil-soluble polymeric hydrocarbon backbone of the dispersant component, and thus takes the position that the molecular weights of 621 for the mono-imide and 1052 for the bis-imide of the claims for succinimide component (D) is within the disclosure of suitable non-borated succinimide compounds taught by Bovington.

The Examiner also takes the position that Bovington teaches both metallic and ashless phosphorus- and sulfur-containing compounds in the invention. The Examiner acknowledges that ammonium and amine salts of the phosphorus-containing compounds are not specifically set forth, but contends that Watts discloses amine salts of organic phosphates as conventional additives in lubricating oil compositions. The Examiner concludes that it would have been obvious to one having ordinary skill in the art at the time of the invention to have added a conventional phosphorus-containing additive, such as an ammonium or amine salt of an organic phosphate, to the composition of Bovington if its known imparted property was so desired. Applicant respectfully traverses this rejection as follows.

Bovington teaches a low viscosity lubricating oil composition containing a dispersant, a calcium and/or magnesium detergent, and optionally a zincdihydrocarbyldithiophosphate, viscosity modifier, pour point depressant, and antioxidant. However, Bovington does not teach or suggest claimed components (A) or (I) or specifically component (D).

The importance of component (A) to the presently claimed composition has been described above. Although Bovington teaches that a variety of base oils may be included in the composition, Bovington does not teach or suggest the claimed mixture of two different oils having specific kinematic viscosities. In fact, Bovington teaches at col. 10, lines 64-67 that the viscosity of the basestock is preferably 3-9 mm^2/s at 100°C. Thus, Bovington certainly does not teach or suggest claimed component (A-2), a heavy mineral oil having a kinematic viscosity at 100 °C of 10 to 50 mm^2/s.

Regarding component (I), Bovington does not teach the inclusion of friction modifiers, and thus does not teach or suggest the claimed fatty acid esters and metal salts of fatty acids.

Accordingly, Bovington does not teach or suggest all of the claimed elements, and even the proposed combination with Watts would not cure the deficiency with Bovington since Watts also does not teach these elements.

Finally, regarding component (D), Bovington teaches the use of a non-borated polyisobutenyl (PIB) succinimide dispersant in which the Mw of the polyisobutenyl ranges from 300 to 20,000 (col. 3, lines 49-51). The minimum molecular weight of the PIB of 300 may be used to calculate the minimum molecular weights of the resulting succinimides. Specifically, succinimides are typically prepared from PIB and, as a polyamine, diethylenetriamine (DETA) or tetraethylenepentamine (TEPA). Assuming the molecular weight of the PIB is 300, the molecular weights of the resulting bis-succinimides would be 851 (using DETA) or 939 (using TEPA). These values are different than the molecular weights of the claimed succinimides prepared from DETA (767) or TEPA (855) when R14 and R15 in formula (4) of component (D) have the longest possible carbon chain of $C_{18}H_{36}$. Accordingly, for at least the reasons set forth above, Bovington in view of Watts does not teach or suggest all of the claimed elements.

Finally, Bovington certainly did not recognize the effects that are provided by utilizing specific succinimides having low molecular weights, as demonstrated in the Morita Declaration. Therefore, it would not have been expected based on Bovington (alone or in view of Watts) that the addition of the specifically claimed succinimide compound, component (D), is very effective at achieving excellent anti-shudder properties and improved fatigue life and any case of *prima facie* obviousness which were to be established based on Bovington would be overcome by the unexpected results exhibited by the presently claimed invention.

Reconsideration and withdrawal of the § 103(a) rejections based on Bovington or based on Bovington in view of Watts are respectfully requested.

Based on the preceding Amendments, Remarks, and Morita Declaration, Applicants respectfully submit that the pending claims are patentably distinct from the prior art of record and in condition for allowance. A Notice of Allowance is respectfully requested.

Respectfully submitted,

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SMK:smk
Enclosures: Request for Continued Examination
Petition for Extension of Time (three-months)
Declaration under 37 C.F.R. § 1.132 of Eitaro Morita